



A portion of the Washington West, D.C., digital raster graphic from the CD-ROM, titled "Capital Cities of the United States."

A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey (USGS) topographic map. The scanned image includes all map collar information. The image inside the map neatline is georeferenced to the surface of the Earth. The DRG can be used to collect, review, and revise other digital data, especially digital line graphs (DLG). When the DRG is combined with other digital products, such as digital orthophoto quadrangles (DOQ) or digital elevation models (DEM), the resulting image provides additional visual information for the extraction and revision of base cartographic information. The USGS is producing DRG's of the 1:24,000-, 1:24,000/1:25,000-, 1:63,360- (Alaska), 1:100,000-, and 1:250,000-scale topographic map series.

Data production is through an innovative partnership agreement with Land Information Technologies, Ltd., of Aurora, Colo. The order and rate of production

will be determined by user requirements and by partnerships with Federal and State agencies. Full coverage of the contiguous United States is expected to be completed in late 1997.

## Producing a DRG

Four items are needed to produce a DRG of a 7.5-minute topographic map:

- (1) a USGS topographic map,
- (2) the Universal Transverse Mercator (UTM) coordinates of the sixteen 2.5-minute grid ticks for georeferencing and rectification,
- (3) a digital image produced by scanning a USGS map on a high-resolution scanner, and
- (4) software to correct distortion and reference the scanned raster image to ground coordinates.

At the USGS, the first step in the process is to scan a paper 7.5-minute topographic map at 250 dots per inch (dpi). The position of each of the sixteen 2.5-minute grid ticks on the image is collected. Software uses these coordinates to rectify and georeference the image to the UTM ground coordinates. A bilinear transformation completes the georeferencing.

The image is compressed using lossless compression to reduce the size of the dataset. The final result is a compressed TIFF 6.0 file. The file size ranges from 5 to 15 megabytes.

## Specifications

The standard USGS 7.5-minute DRG has the following specifications:

- The source material for a DRG is a paper USGS topographic map.
- The USGS DRG's are in TIFF 6.0

and employ GeoTIFF 0.2 specifications to define a set of TIFF tags. These tags describe all cartographic information associated with the file.

- The map is scanned at a minimum resolution of 250 dpi.
- The digital image is georeferenced to the true ground coordinates of the 2.5-minute grid ticks and projected to the UTM for projection consistency with USGS DOQ's and DLG's. The datum of the source materials is preserved in the DRG.
- If scanned at a finer resolution, the image is resampled to 250 dpi. The image is converted to an 8-bit color image in a compressed TIFF file.
- Color values are standard between DRG quadrangles. The USGS uses up to 13 colors on each DRG. Color values are contained in each TIFF file.
- The digital image is accompanied by a metadata file that complies with the Federal Geographic Data Committee's Content Standards for Digital Geospatial Metadata (June 8, 1994).
- The DRG's will be available on Compact Disc-Recordable (CD-R); each CD-R includes the USGS topographic maps for a 1-degree cell. For the contiguous States plus Hawaii, the cells will usually contain sixty-four 1:24,000-scale files, two 1:100,000-scale files, and one 1:250,000-scale file. Variability in the number of files and area covered occurs over irregularly-shaped land masses; for example, 1-degree cells that encompass coastal areas may include fewer files.

## Attribute and Positional Accuracy Requirements

The DRG uses a standard palette to ensure uniform color throughout a particular map series. The RGB values for a particular color, therefore, will remain consistent throughout that DRG series. Although the color values of the DRG may sometimes match those of the paper source map, a user will usually

notice small differences between the colors on the digital image and on the paper map. Also, the quality of the user's monitor affects the DRG color displayed. Although the DRG generally contains the complete content of the source map, features may occasionally be blurred because of substandard source materials. The DRG also may contain misclassified pixels (color noise).

The horizontal positional accuracy of the DRG matches the accuracy of the published source map. To be consistent with other USGS digital data, the image is cast on the UTM projection and will, therefore, not always be consistent with the credit note on the image collar. Only the area inside the map neatline is georeferenced, so minor distortion of the text may occur in the map collar.

The distributed 1:24,000-scale DRG at 250 dpi will have a ground sample distance of 2.4 meters (8 feet).

## Uses of a DRG

The DRG is useful as a backdrop onto which other digital data can be overlaid. At the USGS, the DRG is used for validating DLG's and for DLG data collection and revision. The DRG can help assess the completeness of digital data from other mapping agencies. It can also be used to produce "hybrid" products. These include combined DRG's and DOQ's for revising and collecting digital data, DRG's and DEM's for creating shaded-relief DRG's, and combinations of DRG, DOQ, and DLG data. Although a standard DRG is an effective mapping tool, its full potential for digital production is realized in combination with other digital data.

## Information

For technical information specific to the use of the DRG data on CD-R, contact:

Rolla-ESIC  
U.S. Geological Survey  
1400 Independence Rd., MS 231  
Rolla, MO 65401-2602  
573-308-3500; Fax 573-308-3615  
E-mail: mcmcesic@usgs.gov

For information about cost-sharing with the USGS contact:

DRG Program Manager  
U.S. Geological Survey  
1400 Independence Rd., MS 234  
Rolla, MO 65401-2602  
573-308-3702; Fax 573-308-3652  
E-mail: drg\_pm@usgs.gov

Additional information and sample images can be obtained from the World Wide Web at:

<URL :<http://mcmcweb.er.usgs.gov/>>

For information on other USGS products and services call 1-800-USA-MAPS, e-mail: [esicmail@usgs.gov](mailto:esicmail@usgs.gov), or fax 703-648-5548.

Receive information from the EARTHFAX fax-on-demand system, which is available 24 hours a day at 703-648-4888.

The address for USGS home page is:  
<URL :<http://www.usgs.gov/>>